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Annex 4: Business models for vegetable production on Saba

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In this annex three business models with each four variants are considered. The three business models are: (1) governmental enterprise, (2) public private share cropping, and (3) allotment garden.

The four variants within each model are:

1. 5000 m^2 – rainfed;
2. 10000 m^2 – rainfed
3. 5000 m^2 – irrigated
4. 10000 m^2 – irrigated

The business cases and their variants are based on information gathered during interviews with stakeholders (supermarkets, restaurants, demonstration garden) on Saba. In addition the production results of a vegetable grower on Sint Eustatius were used as a reference. Furthermore economic data from other sources (Project Plan 2013, Wageningen UR reports) were included.

Investments and yearly costs

First the investments needed for vegetable production and the annual costs involved were established. The investments depend on plot size and on availability of irrigation. The results for the 5000 m^2 variants are presented in Table 1.

Table 1: Investments needed for a vegetable production plot of 5000 m^2 on Saba

Investent Fixed Assets	size	unit	price	value	interest	deprec	mainten	costs	
Land investments (general)									
Horticultural land	5000	m^2	$20	P.M.	2.0%	0.0%	0.0%	$2,000	20% of housing land
Clearing & preparing	5000	m^2	$4	$20,000	2.0%	0.0%	0.0%	$400	Project Plan 2013
Fencing the land	424	m^1	$130	$55,154	3.0%	4.0%	5.0%	$6,619	Project Plan 2013
				$75,154				$9,019	
Basic equipment (rainfed)									
Workroom/storage	71	m^2	$200	$14,142	3.0%	4.0%	1.0%	$1,131	WUR Report 267, p.53
Cold store	12	m^3		$10,000	3.0%	7.0%	1.0%	$1,100	KWIN Fruitteelt, p.136
Screenhouse (plant raising)	71	m^2	$100	$7,071	3.0%	8.0%	2.0%	$919	WUR Report 267, p.53
Compost floor	35	m^2	$70	$2,475	3.0%	5.0%	0.5%	$210	KWIN akkerbouw, p.44
Transport (small truck)				$25,000	3.0%	7.0%	4.0%	$3,500	KWIN Fruitteelt, p.133
Transport (boxes, crates0	125	pc	$20	$2,500	3.0%	10.0%	3.0%	$400	KWIN Fruitteelt, p. 134
Garden equipment				$5,000	3.0%	16.0%	4.0%	$1,150	WUR Report 267, p.53
				$66,188				$8,411	
Extra equipment (irrigated)									
Water basin (plastic foil)	250	m^3	$20	$5,000	3.0%	10.0%	5.0%	$900	KWIN Glastuinbouw, p.50
Dripping irrigation	2000	m^1		$18,500	3.0%	7.0%	2.0%	$2,220	Project Plan 2013
				$23,500				$3,120	
Total investments / yearly costs				$164,842				$20,549	

The total investments amount to $165,000. We assumed that the government already owns the land or will buy the land with own funds. The total annual costs for land and equipment amount to $20,500. The

basic investments (for rainfed production) amount to $66,200, with annual costs of $8,400. The extra investments (for irrigated production) amount to $23,500, with annual costs of $3,100.

The investments for the 10.000 m^2 variants are presented in Table 2

Table 2: Investments needed for a vegetable production plot of 10000 m^2 on Saba

Investent Fixed Assets	size	unit	price	value	interest	deprec	mainten	costs	
Land investments (general)									
Horticultural land	10000	m^2	$20	P.M.	2.0%	0.0%	0.0%	$4,000	20% of housing land
Clearing & preparing	10000	m^2	$4	$40,000	2.0%	0.0%	0.0%	$800	Project Plan 2013
Fencing the land	600	m^1	$130	$78,000	3.0%	4.0%	5.0%	$9,360	Project Plan 2013
				$118,000				$14,160	
Basic equipment (rainfed)									
Workroom/storage	100	m^2	$200	$20,000	3.0%	4.0%	1.0%	$1,600	WUR Report 267, p.53
Cold store	12	m^3		$10,000	3.0%	7.0%	1.0%	$1,100	KWIN Fruitteelt, p.136
Screenhouse (plant raising)	100	m^2	$100	$10,000	3.0%	8.0%	2.0%	$1,300	WUR Report 267, p.53
Compost floor	50	m^2	$70	$3,500	3.0%	5.0%	0.5%	$298	KWIN akkerbouw, p.44
Transport (small truck)				$25,000	3.0%	7.0%	4.0%	$3,500	KWIN Fruitteelt, p.133
Transport (boxes, crates0	250	pc	$20	$5,000	3.0%	10.0%	3.0%	$800	KWIN Fruitteelt, p. 134
Garden equipment				$5,000	3.0%	16.0%	4.0%	$1,150	WUR Report 267, p.53
				$78,500				$9,748	
Extra equipment (irrigated)									
Water basin (plastic foil)	500	m^3	$20	$10,000	3.0%	10.0%	5.0%	$1,800	KWIN Glastuinbouw, p.50
Dripping irrigation	4000	m^1		$27,000	3.0%	7.0%	2.0%	$3,240	Project Plan 2013
				$37,000				$5,040	
Total investments / yearly costs				$233,500				$28,948	

The total investments amount to $233,500. We assumed that the government already owns the land or will buy the land with own funds. The total annual costs for land and equipment amount to $29,000. The basic investments (for rainfed production) amount to $78,500, with annual costs of $9,700. The extra investments (for irrigated production) amount to $37,000, with annual costs of $5,000.

The investments and annual costs show economics of scale. For a plot of 5,000 m^2 the annual costs are $20,500 and for a plot of 10,000 m^2 the annual costs are $29,000. This means that the investments and the costs are relatively high for small plots.

Wholesale prices and retail prices

Restaurant and supermarket owners on Saba showed clear interest in locally grown vegetables, because they are much more fresh. Vegetables from abroad are supplied only once a week and sometimes the products are already rotten at arrival. The owners are willing to pay wholesale prices for locally grown vegetables. From a local supermarket owner we got a list of wholesale prices for vegetables. In addition we checked the retail prices of the fresh vegetables presented in the refrigerators in the supermarkets. The price data involved are summarized in table 3

Table 3: Wholesale prices and retail prices of fresh vegetables on Saba (August 2014)

Product	#	unit	price	freight	price	unit	retail
Tomatoes	25	pounds	$25.00	$5.00	$2.67	/kg	$6.50
Cucumber	35	pounds	$24.00	$5.00	$1.84	/kg	$4.00
Paprika - green	25	pounds	$28.00	$5.00	$2.93	/kg	$5.00
Paprika - yellow	25	pounds	$35.00	$5.00	$3.56	/kg	
Paprika - red	25	pounds	$51.00	$5.00	$4.98	/kg	$8.50
Lettuce - romaine	12	3-packs	$42.00	$5.00	$3.92	/3-pack	$4.80
Lettuce - iceberg	30	heads	$35.00	$5.00	$1.33	/head	
Strawberries	8	pounds	$24.00	$5.00	$8.06	/kg	
Water melons	4	fruits	$9.00	$5.00	$3.50	/fruit	
Mangoes	15	fruits	$34.00	$5.00	$2.60	/fruit	
Pumpkin	50	pound	$30.00	$5.00	$1.56	/kg	
Avocado	24	fruits	$30.00	$5.00	$1.46	/fruit	
Banana's	30	pounds	$20.00	$5.00	$1.85	/kg	
Plantain	47	pounds	$27.00	$5.00	$1.51	/kg	
Oranges	80	fruits	$33.00	$5.00	$0.48	/fruit	

The central columns of the table show the weights, prices and freight costs of wholesale packings of vegetables and fruits. In the right hand columns the prices per kg of unit are presented. Most products have wholesale prices of $2-$4 per kg or unit. Retail prices (last column) are about two times higher than wholesale prices.

Production volumes and gross yields per 100 m^2

We had information from a professional vegetable grower on Sint Eustatius. From his production date we could derive an average yield of 4-5 kg/m^2. We took these 4-5 kg/m^2 as a reference and composed a cropping plan for an imaginary vegetable garden at Saba. When selecting crops we took into account the suggestions of restaurant owners for vegetables to be grown locally on Saba. Table 4 shows the gross margin ($ per 100 m^2) for the vegetables selected.

Table 4: Physical yields, product prices, variable costs and gross margins of crops selected.

Crops	Frequency (crops/year)	Physical yield (kg/are)	Wholesale price ($/kg)	Gross yield ($/are)	Variable costs ($/are)	Gross margin ($/are)
Yellow paprika	2	150	$3.50	$1,050	$160	$890
Cucumbers	2	300	$1.80	$1,080	$100	$980
Tomatoes	2	250	$2.70	$1,350	$160	$1,190
Pumpkins	2	200	$1.60	$640	$140	$500
Romaine lettuce	3	150	$4.80	$2,160	$270	$1,890
Average	2.2	450	$2.88	$1,256	$166	$1,090
		(freq x yield)				

On average the cropping frequency is 2.2 crops per year. This frequency is valid for irrigated production. The combination of cropping frequency and physical yields leads to an average production of 450 kg/are or 4.5 kg/m^2. This production level is also achieved by the vegetable grower on Sint Eustatius. The resulting gross margin is $1.090 per are or $100.900 per ha. This sounds high for European standards, but we have to keep in mind that the wholesale prices on islands like Saba are quite high.

Business models and economic results

The economic results of the three business models were calculated, starting from gross margins and annual costs of investments. The results are presented in Table 5.

Table 5 Economic results of business models with two plot sizes and availability of irrigation

Business model	gross margin 100 m^2	usable area plot	gross margin plot	government share	costs investment plot	cash flow for other costs
GOVERNMENT ENTERPRISE		(x 100 m^2)				
- 10000 m^2 rainfed	$545	70	$38,150	$38,150	$23,908	$14,242
- 5000 m^2 rainfed	$545	35	$19,075	$19,075	$17,430	$1,645
- 10000 m^2 irrigated	$1,090	70	$76,300	$76,300	$28,948	$47,352
- 5000 m^2 irrigated	$1,090	35	$38,150	$38,150	$20,549	$17,601
PUBLIC PRIVATE SHARE CROPPING				(50%)		
- 10000 m^2 rainfed	$671	70	$46,970	$23,485	$23,908	-$423
- 5000 m^2 rainfed	$671	35	$23,485	$11,743	$17,430	-$5,688
- 10000 m^2 irrigated	$1,341	70	$93,870	$46,935	$28,948	$17,987
- 5000 m^2 irrigated	$1,341	35	$46,935	$23,468	$20,549	$2,919
ALLOTMENT GARDEN				(1 á 2$/m^2)		
- 10000 m^2 rainfed	$839	70	$58,730	$10,000	$14,160	-$4,160
- 5000 m^2 rainfed	$839	35	$29,365	$5,000	$9,020	-$4,020
- 10000 m^2 irrigated	$1,678	70	$117,460	$20,000	$19,200	$800
- 5000 m^2 irrigated	$1,678	35	$58,730	$10,000	$12,140	-$2,140

The differences in gross margin between the three business models result from assumptions on yield levels and price references for the three models. Public private share cropping may result in 20% higher

yield, while an allotment garden may result in 20% lower yields than the government enterprise. These differences are linked to motivation and expertise expected. In the allotment garden model the price reference is retail prices. In the two other models wholesale prices are the reference. Furthermore we assumed an average of 1.1 crop cycle per year under rainfed conditions and 2.2 crop cycles per year under irrigated conditions

The usable area in all cases is assumed to be 70%. Combining the gross margins per 100 m^2 with the usable area (x 100 m^2) results in the gross margin of the whole plot. The gross margin varies between $19,075 (government enterprise, rainfed production) to $58,730 (allotment garden, irrigated production) for a production plot of 5,000 m^2. For a production plot of 10,000 m^2 the gross margins are twice as high.

The government share in the gross margin differs between the three models. In the government enterprise model the whole gross margin is for the government. In the public private share cropping model the government gets 50% of the gross margin. In the allotment garden model the government just gets the land rent.of $1 per m^2 in the rainfed situation and $2 per m^2 in the irrigated situation. The complement of the gross margin is for the citizens of Saba. The complement is highest in the allotment garden model. On the other hand this model may result in a decrease of turnover for supermarkets and restaurants.

The annual costs of the investments needed in the various situations come from Table 1 and Table 2. What remains is the cash flow for covering other costs or financing other investments. This cash flow is highest for 10,000 m^2 – irrigated land and lowest for 5,000 m^2 – rainfed land. Overall the government enterprise model is most attractive for the government. This model provides the best chances for the government to earning back the investment in a vegetable garden.

From the calculations the following conclusions can be drawn:

1. Don't make the garden to small. The investments are earned back faster in a 10,000 m^2 situation than in a 5,000 m^2 situation;
2. Aim at an irrigated vegetable garden. The additional investments for irrigation are earned back in one year (10.000 m^2) or two years (5,000 m^2);
3. Start the vegetable garden as a government enterprise. This model provides the best chances to earn back the investments needed.

Achilles heels of the vegetable garden on Saba are know-how of vegetable production and availability of manure and/or compost. For know-how the Inifat project can serve as a resource. For manure/compost cooperation with the livestock farmers on Saba may provide a solution. It is a way to close nutrient cycles from supermarkets and restaurants (waste) via livestock farmers (pigs and cows) and vegetable producers back to supermarkets and restaurants.